Early publications about nonzero cosmological constant

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ABSTRACT

In 2011 the Nobel Prize in Physics was awarded for the 1998 discovery of the nonzero cosmological constant. This discovery is very important and surely worth to receive the Nobel Prize. However, years earlier several papers had been published (Paál, Horváth, & Lukács 1992; Holba et al. 1992, Holba et al. 1994) about a very similar discovery from observational data.

Subject headings: History of astronomy; Cosmology: cosmological parameters — dark energy — large scale structure of the Universe

1. 2011 Nobel Prize Winners in Physics

"The Nobel Prize in Physics 2011 was divided, one half awarded to Saul Perlmutter, the other half jointly to Brian P. Schmidt and Adam G. Riess for the discovery of the accelerating expansion of the Universe through observations of distant supernovae." the nobelprize.org wrote. [1]

Two research teams, Supernova Cosmology Project (SCP) lead by Saul Perlmutter and High-z Supernova Search Team (HZT) headed by Brian Schmidt, raced to map the Universe by locating the most distant supernovae. The two research teams found over 50 distant supernovae which were dimmer than expected - this was a sign that the expansion of the Universe was accelerating [1], [2].

Theoretically, this was not new idea since Albert Einstein came out the idea of cosmological constant (often marked Lambda). Einstein did that because he was guided by the paradigm of the day that the Universe was static. When he heard the Edwin Hubble discovery that the Universe was actually expanding he declared that the inclusion of the cosmological constant was his "biggest blunder". Since there was no observation for cosmological constant after that most scientists assumed that Lambda is zero. A series of papers were published in Astrophysics and Space Science in the early 90's years before the supernova publications calculated Ω_Λ from observed data.

2. Earlier Publications About Positive Cosmological Constant

Paál et al. [3] used the so called pencil beam survey [4] to find out whether the regularity found in the galaxy distribution is quasiperiodical or not. It was found that q_0

[1] http://www.nobelprize.org/nobelprizes/physics/laureates/2011/

was preferably negative [3]. Therefore a nonzero Lambda term was needed. The preferred value was Ω_Λ equal 2/3. This is very close to the value that later was observed by the Nobel Prize winners.

In the second paper [5] a two parameter fit was made. The positive cosmological constant (negative q_0) found to be still needed. In the third paper [6] optical and radio quasars were also used to find the preferred cosmological parameters. Figure 8. in that paper [6] showed the results (see figure). As it was written the contour meant 80% confidence level. The preferred region is similar that the supernovae analisys later suggested. For comparison please see this www page http://vizion.galileowebcast.hu/HOI/Comparation.jpg Therefore those earlier suggestions also support the Nobel Prize winning results.

The author thanks for his supervisors, B. Lukács and G. Paál, to being part of these researches. Unfortunately, G. Paál died in 1992. This was surely affected the fact that these results were almost unrecognized.

REFERENCES

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[2] Riess, A. G. et al., 1998, AJ, 116, 1009

[3] Paál, G., Horváth, I., & Lukács, B. 1992, Ap&SS, 191, 107

[4] Broadhurst, T. J. et al., 1990, Nature, 343, 726

[5] Holba, A., Horváth, I., Lukács, B., & Paál, G. 1992, Ap&SS, 198, 111

[6] Holba, A., Horváth, I., Lukács, B., & Paál, G. 1994, Ap&SS, 222, 65

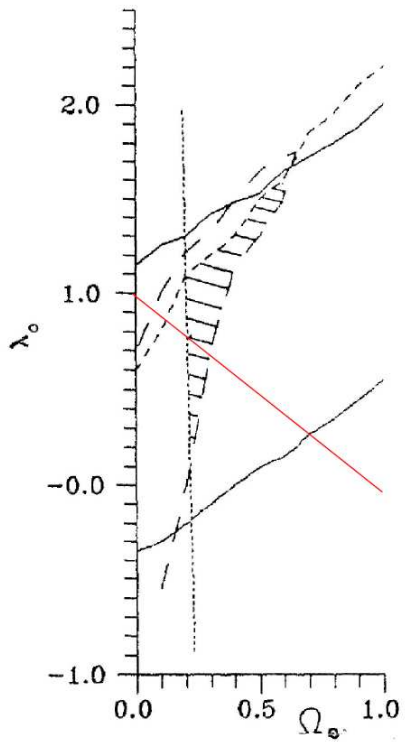

Fig. 8. The admissible region of regularity on the (Ω_0, λ_0) plane. Solid: 80% significance border of regularity for galaxies. Long dash: Same for radio quasars. Short dash: Same for optical quasars. Dotted: Lower density limit. Hatched: The admissible region.

Fig. 1.— This figure was published in Holba et al. (1994) (figure 8. in that article). The red line represents the flat cosmological model.